Dealing with Pertussis May, 2004

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Overview

- Disease
- Laboratory Testing
- Treatment
- Trends

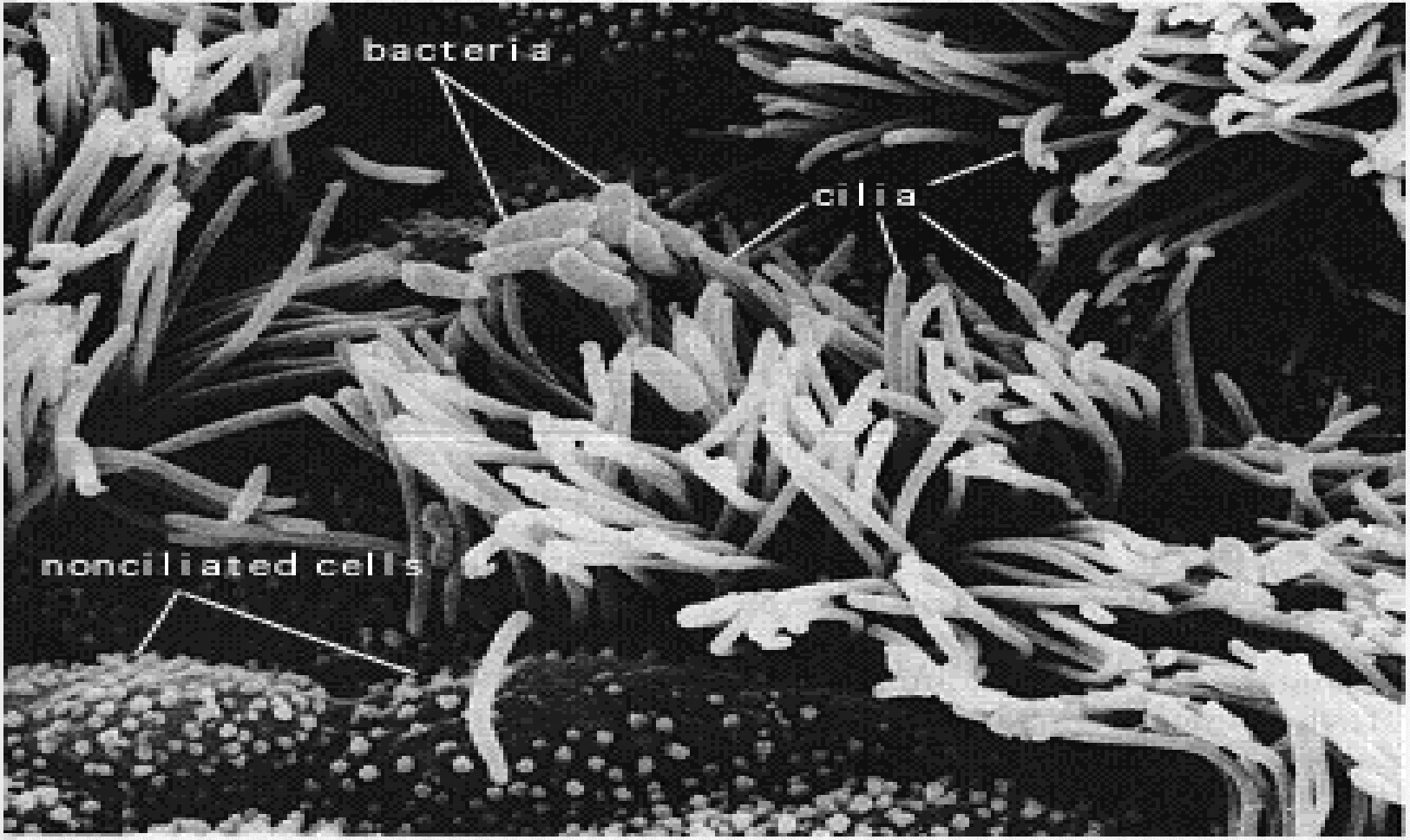
The Disease

- Highly contagious respiratory infection
- Incubation period 5-10 days
- Insidious onset, nonspecific cough
- Fever usually minimal throughout course

Pathogenesis

- **Attachment to cilia of ciliated epithelial cells in respiratory tract**

Colonization of tracheal epithelial cells by *Bordetella pertussis*



Pathogenesis

- Attachment to cilia of ciliated epithelial cells in respiratory tract
- Pertussis antigens allow evasion of host defenses (lymphocytosis but impaired chemotaxis)
- Local tissue damage in respiratory tract
- Systemic disease may be toxin mediated

Clinical Features

- **Catarrhal stage** — **1-2 weeks**
- **Paroxysmal cough stage** — **1-6 weeks**
- **Convalescence** — **Weeks to months**

Epidemiology

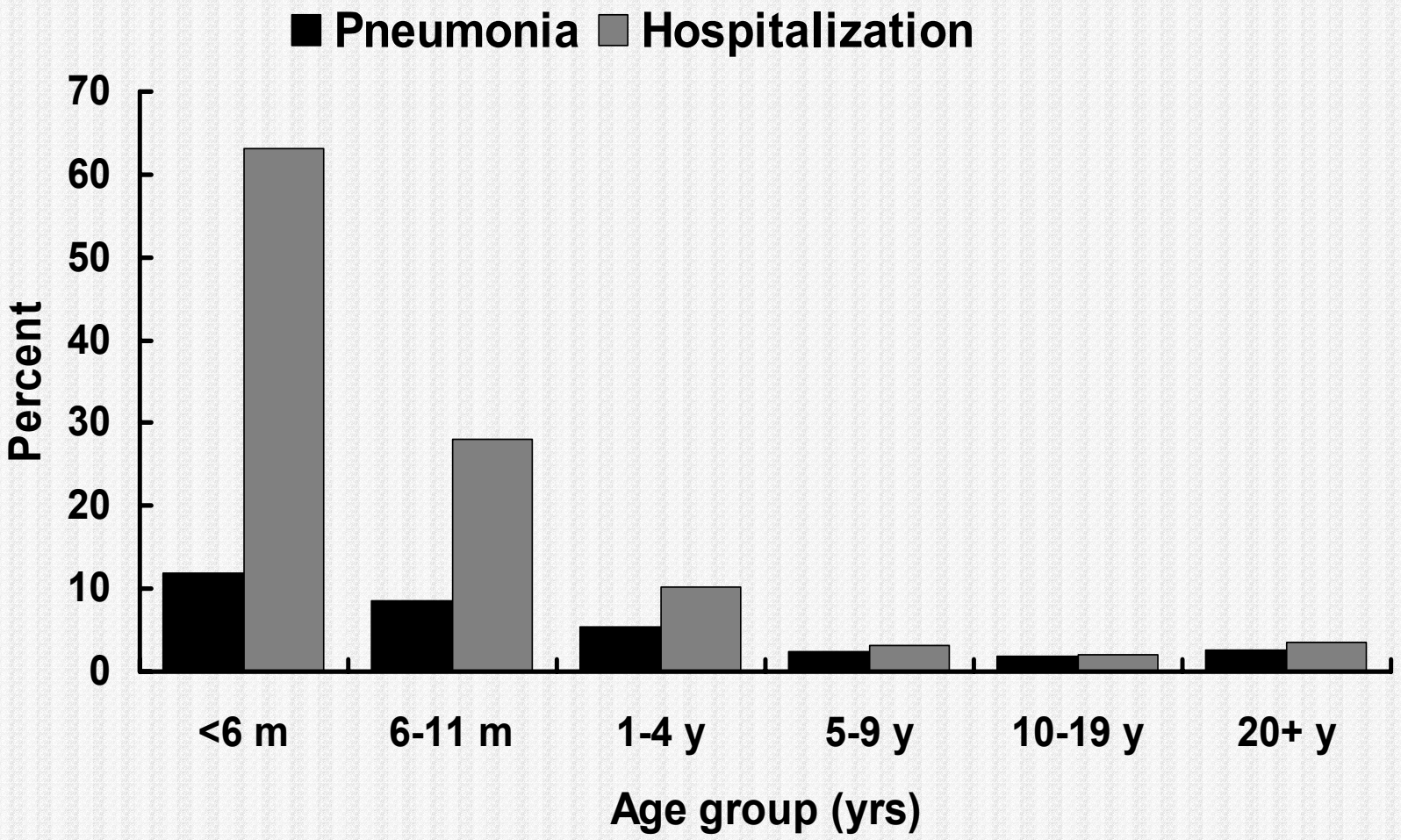
- **Reservoir** — **Human**
  Adolescents and adults
- **Transmission** — **Respiratory droplets**
  Airborne rare
- **Communicability** — **Maximum in catarrhal stage**
  Secondary attack rate
  up to 90%

Complications*

Condition	Percent Reported
Pneumonia	5.2
Seizures	0.8
Encephalopathy	0.1
Death	0.2
Hospitalization	20

*Cases reported to CDC 1997-2000 (N = 28,187)

Complications



Pertussis in Adults

- Accounts for up to 7% of cough illnesses per year
- Disease often milder than in infants and children
- Adults often source of infection for children

Laboratory Testing

- Serological Testing
- Direct Fluorescent Antibody Testing (DFA)
- Culture
- Polymerase Chain Reaction (PCR)

Serological Testing

- Not standardized
- Difficult to interpret
- Different antigens measured by different techniques
- No method validated between laboratories
- CDC does not recognize it as confirming the diagnosis

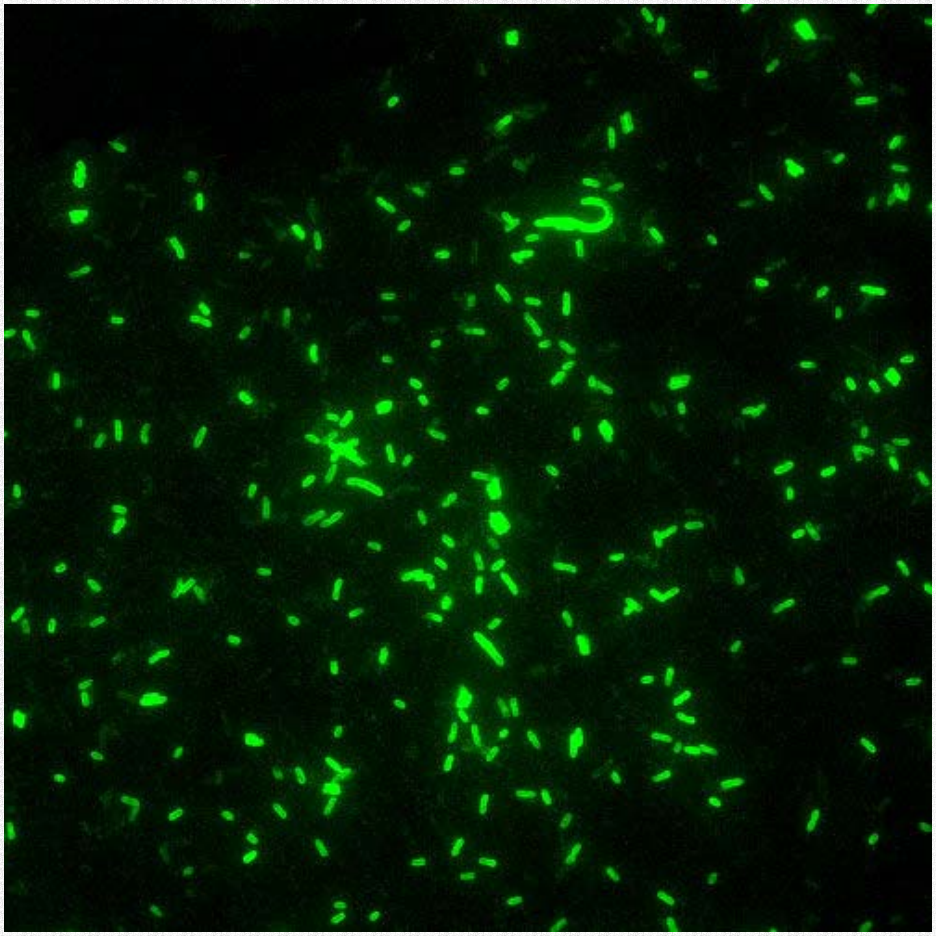
Sample Collection

- Nasopharyngeal swabs or aspirates (both sides!)
- Cotton swabs inhibit growth
- Calcium alginate or dacron ok
- Direct plating is optimal
- Transport quickly if culture requested

Direct fluorescent antibody (DFA) staining

- Screening method and requires confirmatory testing
- Low sensitivity and variable specificity
- Cannot be relied upon as a criterion for laboratory confirmation if performed from a clinical specimen
- DFA testing can be used to confirm a culture positive isolate

Bordatella pertussis
DFA Stain



Culture (gold-standard)

- Most successful during catarrhal stage when clinical suspicion is least
- Fastidious growth requirements make isolation difficult
- Successful isolation declines with increasing age of patient, with initiation of antibiotic therapy and/or with delayed specimen collection (post 3 weeks of illness)

Polymerase Chain Reaction (PCR) Detection

- Rapid, sensitive and specific
- Organism viability is not required; cannot distinguish between viable and dead organisms
- Beneficial in detecting disease in vaccinated patients, patients undergoing antibiotic therapy or patients with recent exposures to infected individuals

Treatments

- **Erythromycin**

  40-50 mg/kg/d in 4 divided doses; 10-14 days

- **Trimethoprim (T)/Sulfamethoxazole (S)**

  8mg/kg T + 40 mg/kg S/d in 2 divided doses; 14 days

Treatments (cont)

- **Azithromycin**

  No consensus for dose/duration

  10-12 mg/kg/d; 5 days (AAP)

  10 mg/kg/day 1, 5 mg/kg next 4 days for adults; 10 mg/kg/d, 5 days for kids (CDC)

- **Clarithromycin**

  No consensus for dose/duration

  15-20 mg/kg; 7 days (AAP); 10-14 days (CDC)

Treatment (cont)

- Does not generally lessen duration; protects others
- Limited benefit if begun >21 days after onset/exposure
- Exception: high risk cases/contacts - treat up to 6 weeks

What About Contacts?

- Effects of prophylaxis uncertain
- Canada does not recommend unless infants involved
- Even less known about effective antibiotics, doses, duration

Use a narrow definition of close contact:

- Direct face-face contact >1 hr/week
- Shared confined space >10 hr/week
- Direct contact with secretions

Exclusions from work/school:

- Symptomatic: first 5 days of treatment
- Symptomatic, refuses treatment: exclude for 21 days from onset of symptoms
- Asymptomatic: no exclusion

Outbreaks

- **Institution: 2 or more cases clustered in time/space**
- **Community:**
  - **Higher than expected;**
  - **For a given population;**
  - **In a defined time period**

In community outbreaks:

Consider:

- Accelerated immunization schedule for infants
- Give DTaP at 6, 10, 14 weeks of age
- Don’t let any infants fall behind

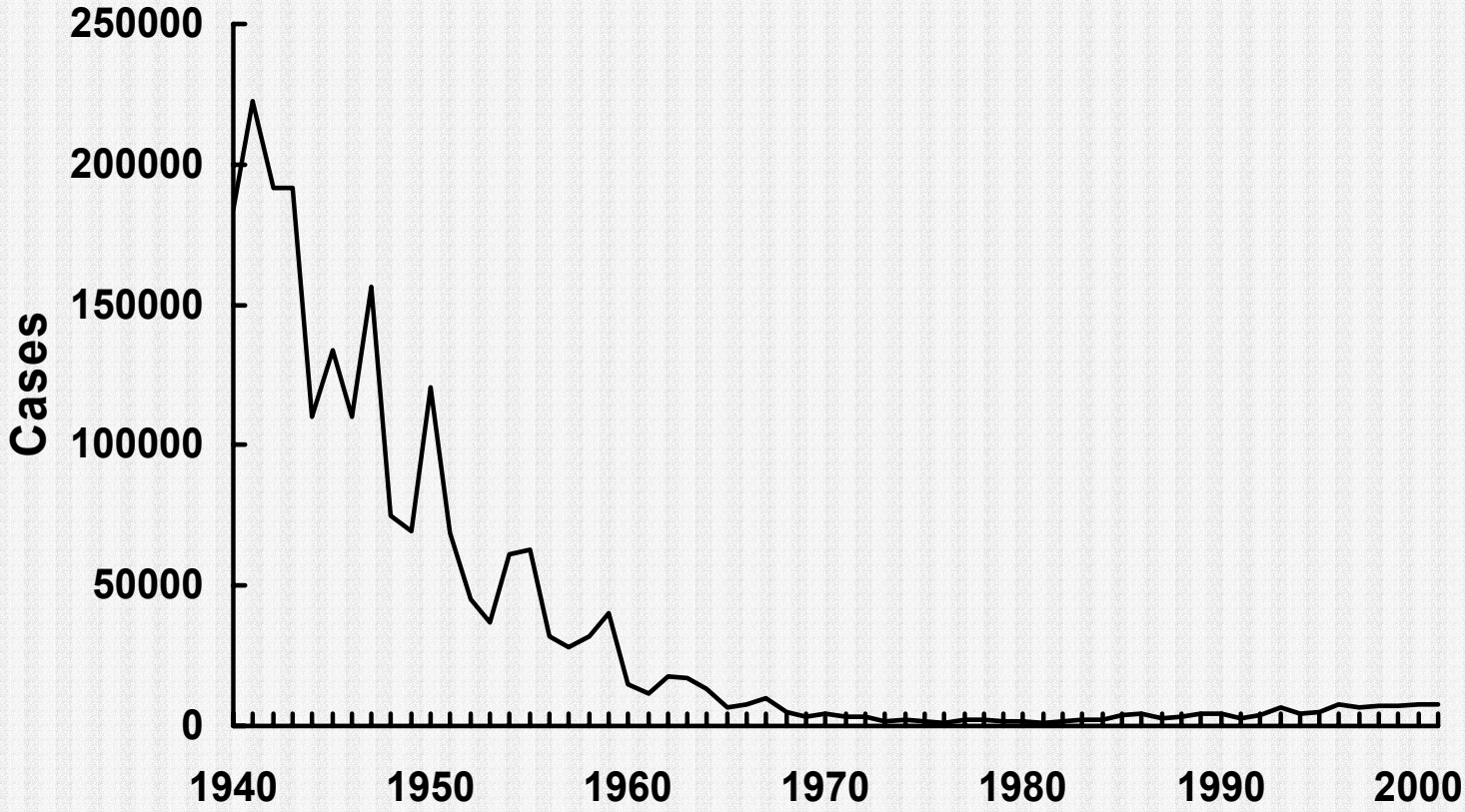
Case Definitions

- Confirmed
  - Culture positive, regardless of duration
  - PCR positive PLUS symptoms (below)
  - Epi-linked to a confirmed case
- Probable
  - 14 days cough PLUS
  - Whoop, paroxysms, vomiting
  - DFA or serological results don’t matter!

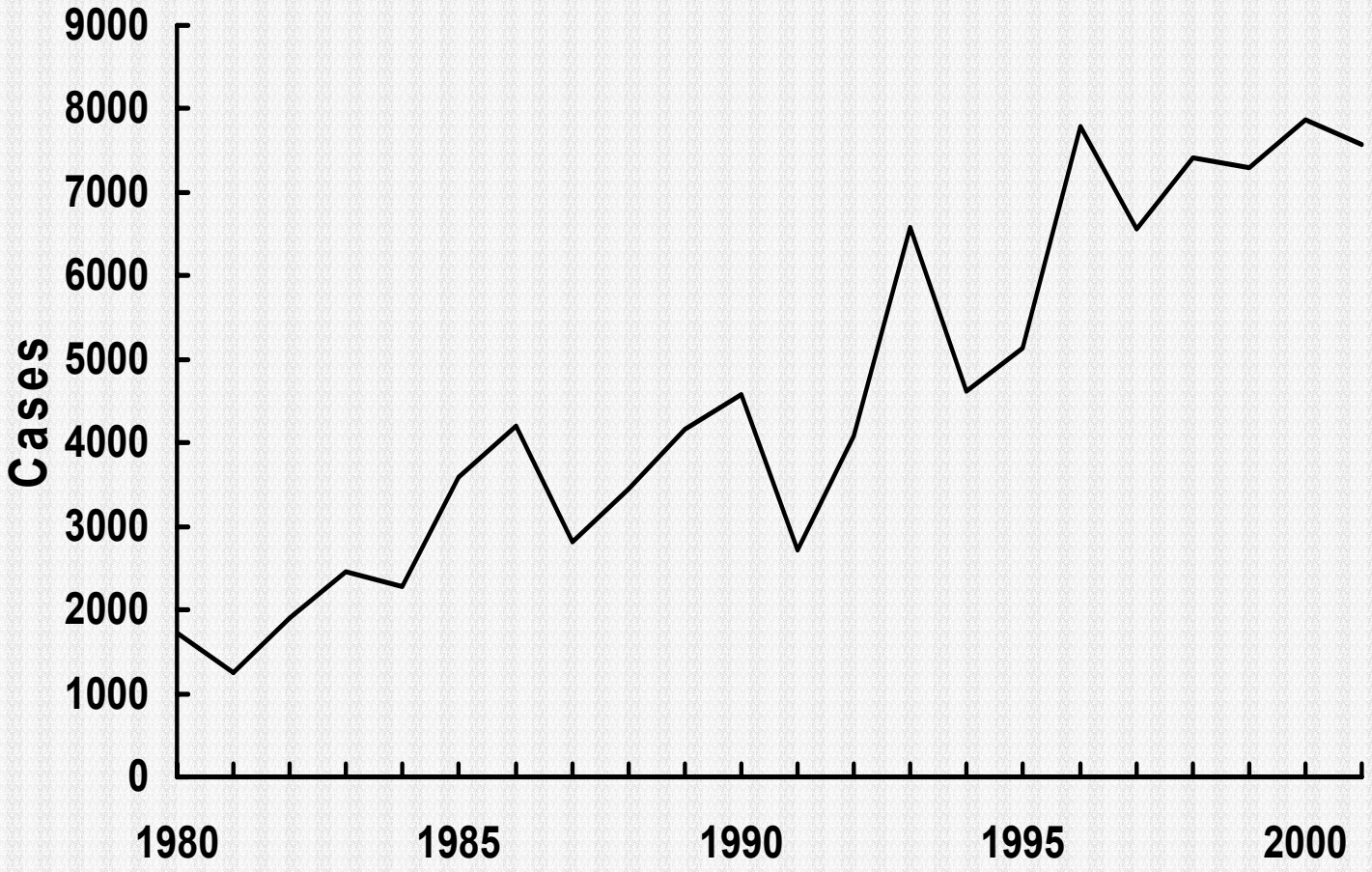
General Characteristics

- Cyclical
- Peaks every 3-4 years
- **Lows:**
  - US: 1976, 1,010 cases
  - VA: 1981, 10 cases

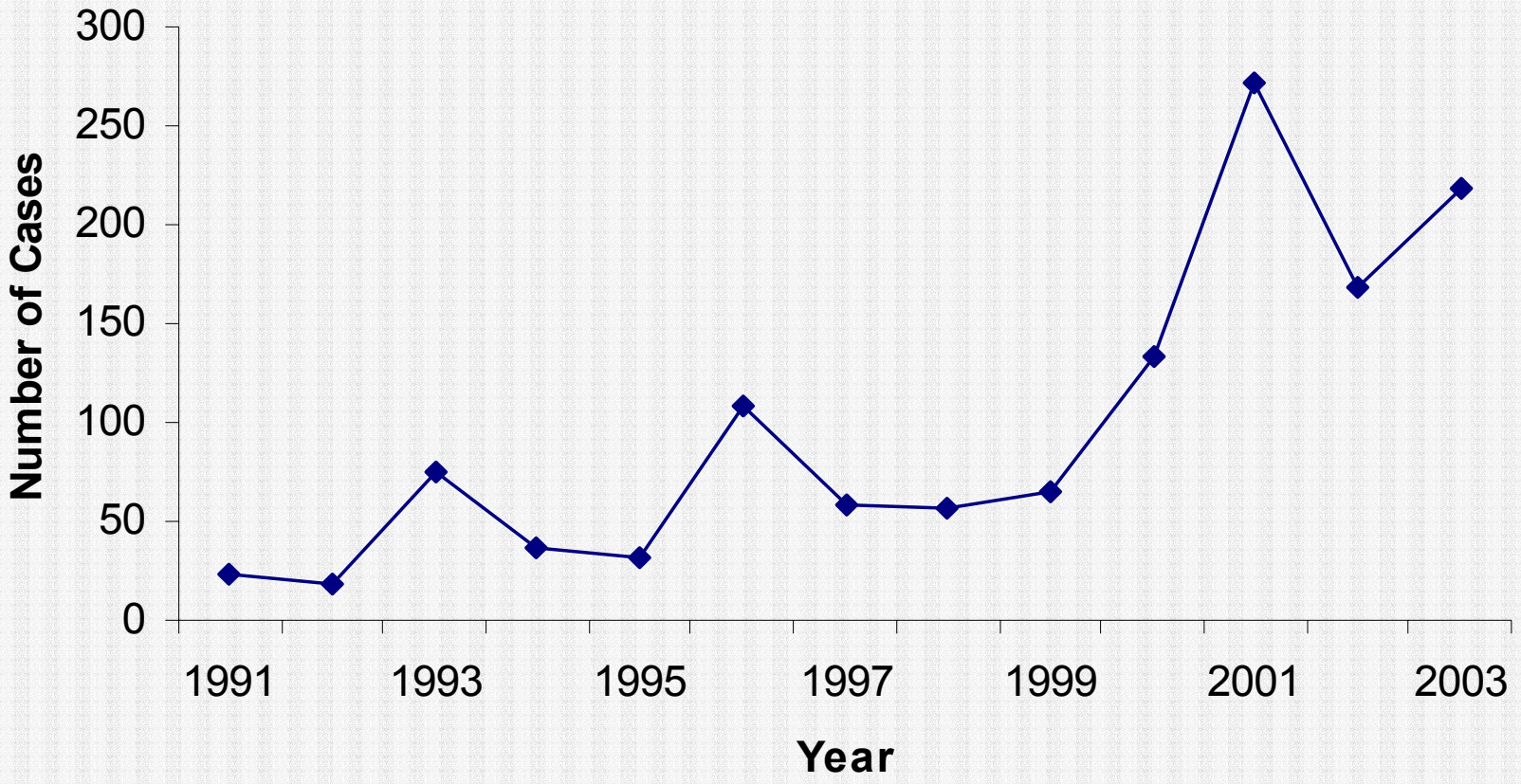
US Trends: Number of Cases



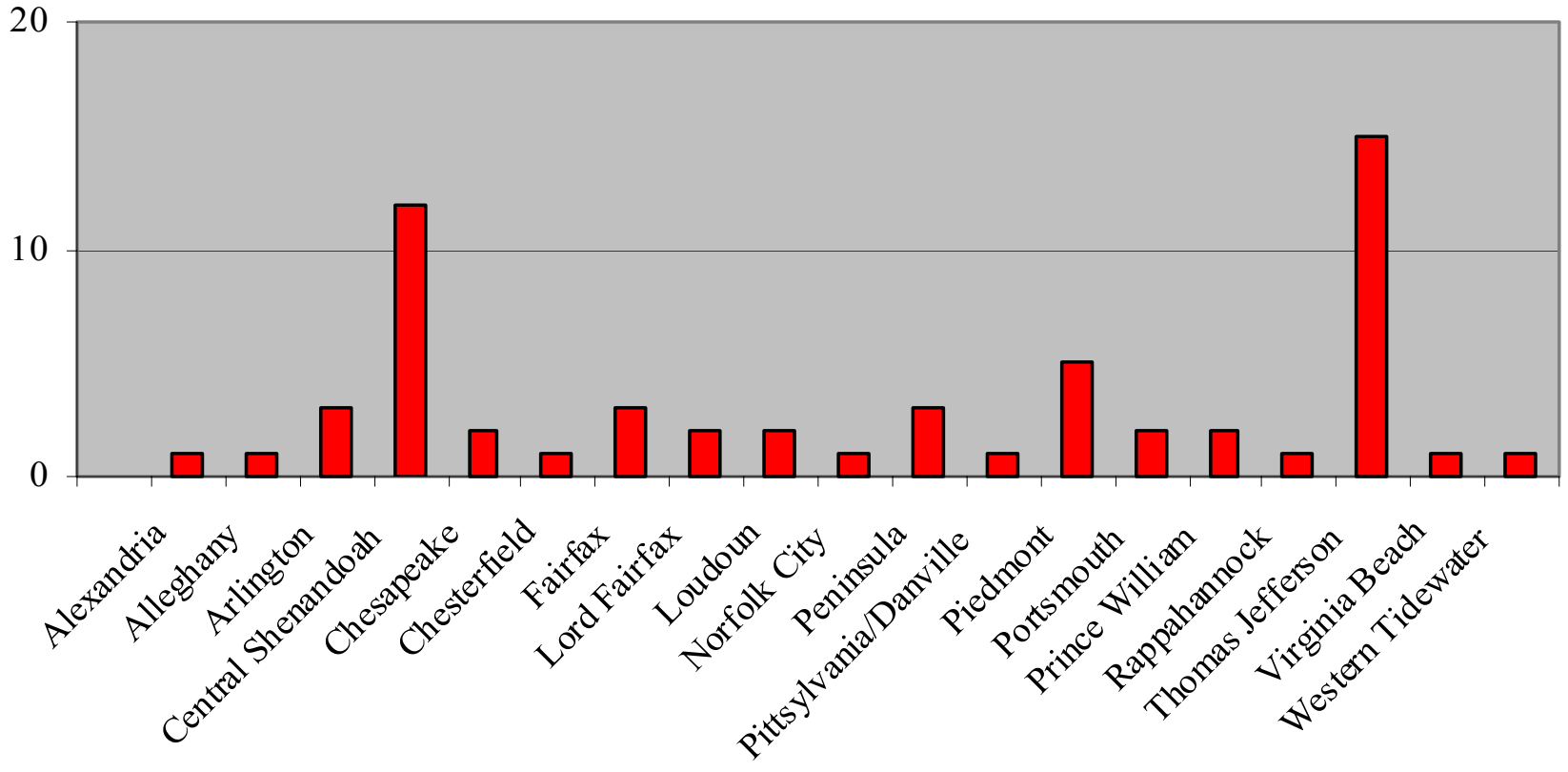
US Trends: Number of Cases



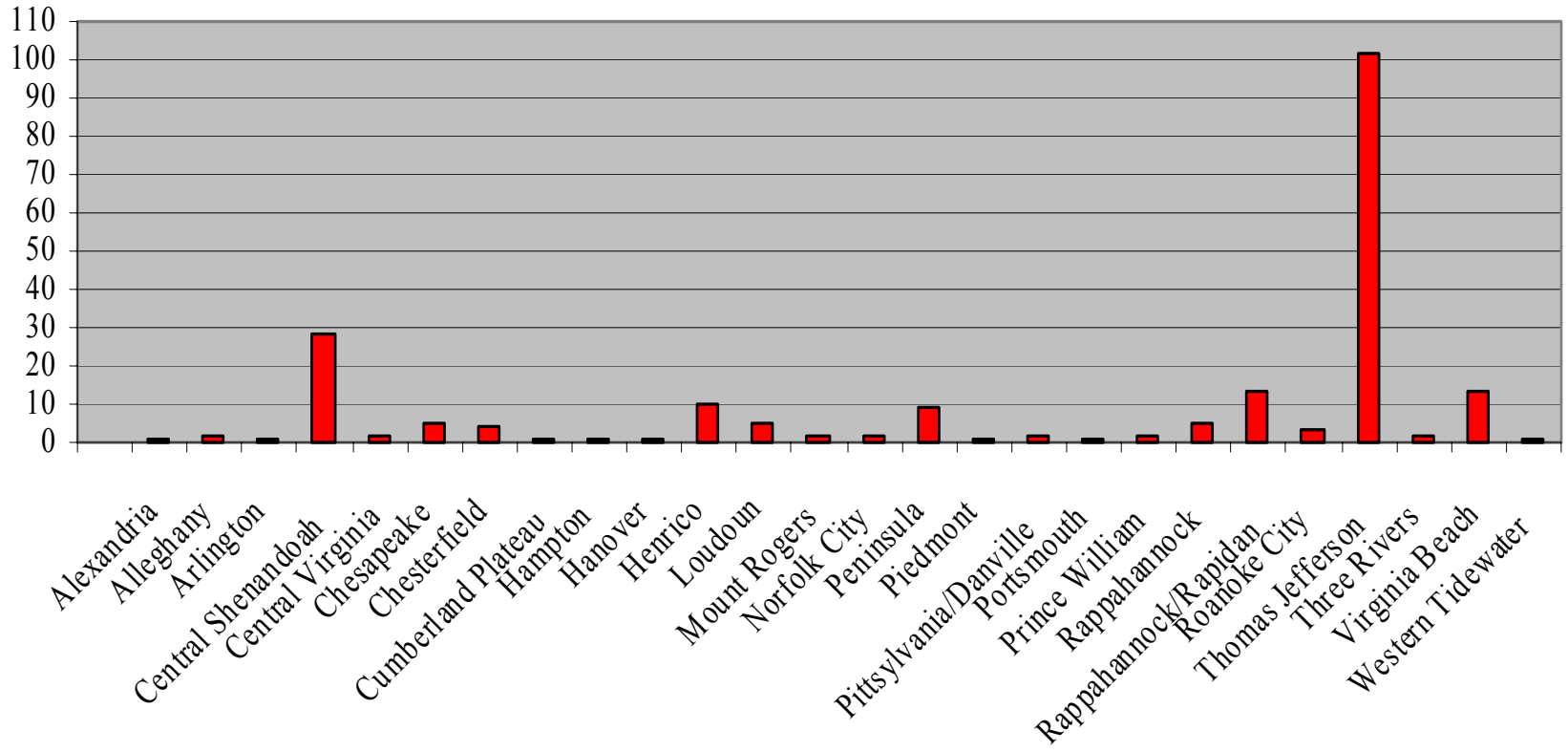
Virginia Trends: Number of Cases



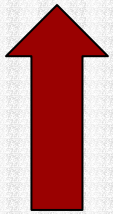
Number of Cases by Health District
1997



Number of Cases by Health District
2003



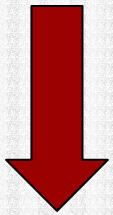
US Trends*: Ages Affected



62%, adolescents

60%, adults

11%, infants

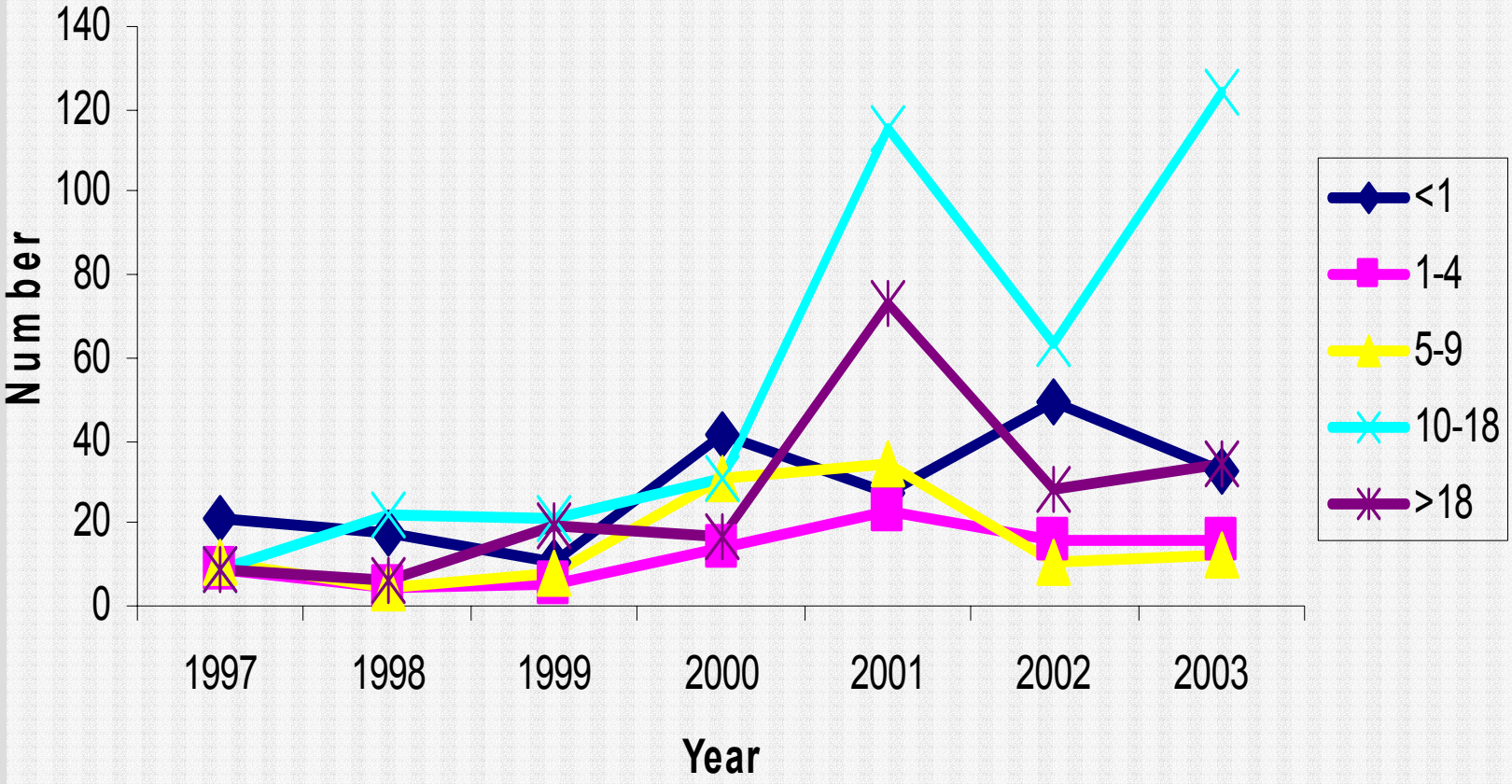


8%, children 1 - 4 years

Stable: Children 5 - 9 years

* 1997 - 2000 compared to 1994 - 96

Virginia Trends: Ages Affected



US Trends: Hospitalizations

Age Group	No.	% of age group
<6 mo	7,203	63.1
6-11 mo	1,073	28.1
1-4 yrs	3,137	10.3
5-9 yrs	2,756	3.1
10-19 yrs	8,273	2.1
>19 yrs	5,745	3.5
Total	**28,187**	**20.0**

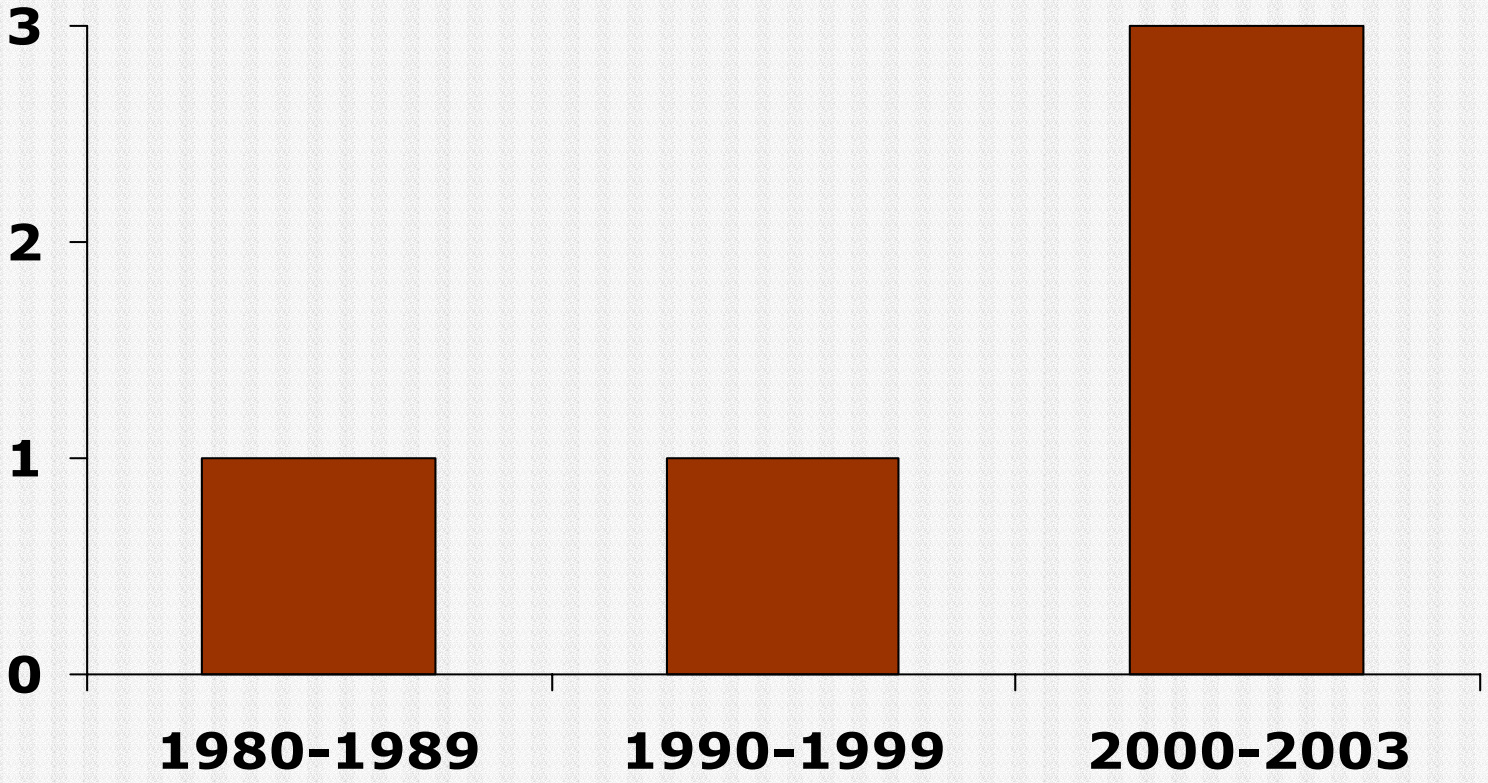
Virginia Trends: Hospitalizations

Age Group	No.	% - age group	% - total
<6 mo	126	67.4	82.4
7-11 mo	2	15.4	1.3
1-4 yrs	5	5.7	3.3
5-9 yrs	5	4.5	3.3
10-18 yrs	8	2.1	5.2
>18 yrs	7	3.8	4.6
Total	**153**		**15.7**

US Trends: Deaths

Age Group	1980-89 Number	1980-89 %	1990-99 Number	1990-99 %
0-11 mo	61	79	93	90
1-4 yr	13	17	2	2
5-9 yr	1	1	6	6
10-19	0		0	
>20 yr	1	1	2	2
Total	**77**		**103**	

Virginia Trends: Deaths



All recorded deaths in children <4 mo of age

WHY?????

Possible Reasons

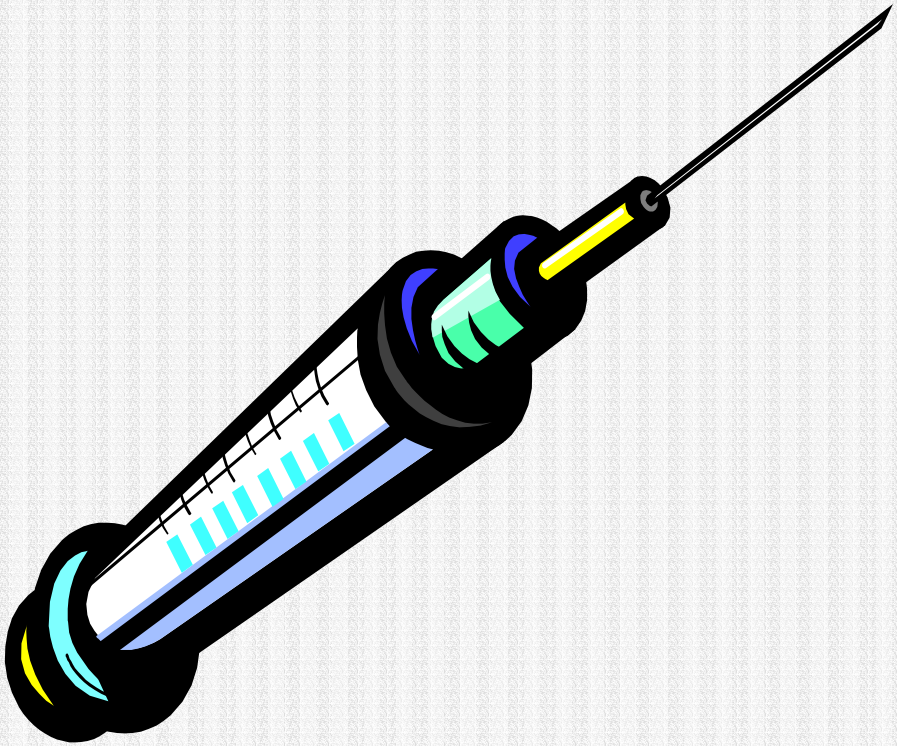
- Increased recognition in older age groups
- Mild disease
  - Most frequent in all age groups
  - May go undiagnosed & untreated
  - Contributes to transmission
- Waning immunity

Possible Reasons, cont.

- Changes in data collection methods
  - Epi-links considered confirmed cases, 1995
- More sensitive lab testing introduced
  - PCR, 1995
- Some strains may not be included in vaccine

What to do?

ADOLESCENT/ADULT BOOSTER!



Vaccine Related Issues

- Given NOT primarily to protect individual; rather others
- 15-20% protection: 1st dose
- Substantially more with 2nd dose
- 3 doses required for acceptable protection
- Inactivated vaccine requires periodic boosting

When to Boost?????

- Fifth dose recommended when 4th dose given before age 4 years
- The closer the booster can be given to 7 years of age, the longer the protection

Vaccination of Children Who Have Recovered From Pertussis:

- If documented disease, do not need additional doses of pertussis vaccine
- Satisfactory documentation of disease:
  - recovery of B. pertussis on culture, OR
  - typical symptoms and clinical course when epidemiologically linked to a culture- proven case

Pertussis Vaccine for Adults

- No pertussis vaccine licensed for use in adults in the United States
- Acellular pertussis vaccine safe and immunogenic in adults
- Impact on disease or transmission unknown
- Not routinely recommended at this time

WHEN?????

- Canada already has approved a booster (14-16 yrs)
- So have Austria, Germany and French Guiana
- In clinical trials here
- Hopefully, FDA will approve soon!

Until then.....

- Suspect pertussis in folks with unexplained persistent cough
- Use PCR to rapidly identify adolescents and adults with mild disease
- Treat in order to prevent more severe disease in unprotected infants

QUESTIONS?